2012 Annual Report
PI: Derek Lovely, University of Massachusetts
ONR Award: N000141210229
Title: Mechanisms Underlying the Metallic-Like Conductivity of Microbial Nanowires

Scientific and Technical Objectives

The overall objective of this research is to elucidate the mechanisms for the metallic-like conductivity of *Geobacter sulfurreducens* pili in order understand this novel biological phenomenon and to provide information for optimizing practical application of pili or pili mimetics. Specific short-term objectives are to: 1) investigate the mechanisms underlying metallic-like conductivity; 2) develop a structural understanding of the pili to probe the conduction mechanism at a molecular level; and 3) identify strategies for increasing the conductance of pili.

Approach

(b) (4)

Concise Accomplishments

(b) (4)

Expanded Accomplishments

(b) (4)

(b) (4)

(b) (4)

Work Plan

(b) (4)

Major Problems
None

Technology Transfer
None in the first six months of this project.

Foreign Collaborations and Supported Foreign Nationals
Nikhil Malvankar is the primary postdoctoral researcher working on this project.

Productivity

Publications:

1. Lovley, D. R. 2012. Electromicrobiology. Ann. Rev. Microbol. 66:391-409.
2. Malvankar, N. S., M. T. Tuominen, and D. R. Lovley. 2012. Lack of invovlement of c-type cytochromes in long-range electron transport in microbial biofilms and nanowires. Energy. Environ. Sci. (postive reviews, revision resubmitted)

Presentations at Scientific Meetings:

Derek R. Lovley. March 2012. Electromicrobiology: Application to novel bioenergy and bioremediation applications. 22nd Annual International Conference on Soil, Water, Energy, and Air. San Diego, CA.

Derek R. Lovley. April 2012. Long-range electron transport via pili with metallic-like conductivity. Biochemical Society Focused Meeting-Electron Transfer at the Microbe-Electrode Interface. East Anglia, UK. Invited talk.

Derek R. Lovley. April 2012. Electromicrobiology. Annual Meeting of the Dutch Society for Microbiology. Arnhem, Netherlands. Plenary Address.

Derek R. Lovley. April 2012. The role of electrically conductive pili and minerals in biogeochemical processes. Geomicrobiology and its significance for biosphere processes. Manchester, UK. Keynote address.

Nikhil S. Malvankar, Madeline Vargas, Mark T. Tuominen, Derek R. Lovley. March 2012. Metal-like transport in proteins: A new paradigm for biological electron transfer, American Physical Society Meeting, Boston, MA.